

**SHAMPOO COMPOSITION**

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Inventor(s): SHINJIYOU ZENTAROU; others: 01  
Applicant(s): LION CORP  
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**Abstract**

**PURPOSE:**The titled composition that contains, as essential components, an anion surfactant, a cation surfactant and a fatty acid of an odd carbon number in a specific proportion, thus having good foaming and cleaning actions, making hair wiry and moist and developing hair nourishment.

**CONSTITUTION:**The objective shampoo composition contains, as essential components, (A) 3-40wt% of an anionic or amphoteric surfactant, (B) 0.1-5wt% of a cationic surfactant or a quarternary ammonium-containing water-soluble polymer with a cationization density of 0.0005-0.005 and (C) 0.1-10wt% of a higher fatty acid or higher aliphatic alcohol of an odd carbon number or their derivative. The anionic surfactant is, e.g., an alkali metal or alkanolamine salt of lauric acid, the amphoteric surfactant is, e.g., lauryl beta-iminodipropionate and the cationic surfactant is, e.g., a quarternary ammonium salt.

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⑭ 発明の名称 シャンプー組成物

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⑰ 発 明 者 新 條 善 太 郎 習志野市本大久保3の14の2

⑱ 発 明 者 池 内 隆 佐倉市上座732の110

⑲ 出 願 人 ライオン株式会社 東京都墨田区本所1丁目3番7号

⑳ 代 理 人 弁理士 鈴江 武彦 外2名

## 明 細 書

## 1. 発明の名称

シャンプー組成物

## 2. 特許請求の範囲

(イ) アニオン界面活性剤又は両性界面活性剤を3ないし40重量%、(ロ) カチオン界面活性剤又はカチオン化密度が0.0005ないし0.005の第四級窒素含有水溶性ポリマーを0.1ないし5重量%、(ハ) 奇数鎖長高級脂肪酸若しくは奇数鎖長高級脂肪酸アルコール又はこれらの誘導体を0.1ないし10重量%含むシャンプー組成物。

## 3. 発明の詳細な説明

## 〔産業上の利用分野〕

この発明はシャンプー組成物に関し、特に養毛効果とコンディショニング効果を併せ持つシャンプー組成物に関する。

## 〔従来技術〕

従来より、養毛料などの毛髪化粧料には、養毛、育毛効果が期待される各種の養効剤が配合されている。養効剤としては、例えばビタミンEな

どのビタミン類、セリン、メチオニンなどのアミノ酸類、アセチルコリン誘導体などの血管拡張剤、紫根エキスの抗炎症剤、エストラジオールなどの女性ホルモン剤、セファランチンなどの皮膚機能亢進剤、パントテン酸銅などのメラニン合成触媒剤、サリチル酸などの角質溶解剤などが配合され、脱毛症の予防及び治療に用いられている。

脂肪酸又はその誘導体を養毛剤等の毛髪化粧料に配合した例としては、オリーブ油、ヒマシ油等の天然植物油あるいはステアリン酸を製品の物性を改善する目的で配合したものがある。しかし、これらのほとんど全てが偶数の炭素鎖長を有する脂肪酸である。従って、従来の市販品においては、炭素数が奇数の脂肪酸又はその誘導体を養毛、育毛を目的として毛髪化粧料に配合した例はない。また、ヘアーリンス等の毛髪化粧料に配合される高級アルコールに関しても、これまでに市販されているものはいずれも偶数鎖長の炭素を有するアルコール又はその誘導体であり、奇数鎖長

アルコールを育毛成分として使用した例はない。

特開昭59-27809号によれば、奇数鎖長の脂肪酸又はその誘導体は、偶数鎖長のものとは異なり、育毛効果を有することが見出され、奇数鎖長の脂肪酸又はその誘導体を有効成分とするシャンプー組成物が提案された。

#### 〔従来技術の問題点〕

しかしながら、こうしたシャンプー組成物は、洗髪、水洗いすすぎの後に一般に「きしみ」といわれているギシギシした髪の感触が残り、タオルドライ後の生乾きの時の梳毛性（櫛、ブラシの通り）が悪くという欠点がある。さらに、完全に乾燥した時、髪のまとまりや梳毛性も悪く、湿度の低い時期にはブラッシングで静電気が発生しやすく、その結果、毛髪の浮き上がり、すなわち、ヘアースタイルが起き、一層、ブラシ通りが悪くなる欠点がある。

#### 〔発明の目的〕

この発明の目的は、洗髪及びすすぎ時の「き

ることができる。すなわち、毛髪等の洗浄に使用したときは、高い起泡性と適度の洗浄力を発揮し、すすぎ時には「きしみ」が抑えられ、髪の仕上りに際しては、毛髪がまとまり易くなり、べとつくようなこともなく、しなやかにかつしっとりとして仕上げ、良好な梳毛性を与える。さらに、乾燥時のヘアースタイルを防止する。また、奇数鎖長高級脂肪酸若しくは奇数鎖長高級脂肪酸アルコール又はこれらの誘導体が頭皮より毛根に良好に浸透し、優れた養育毛効果を発揮する。

#### 〔発明の具体的説明〕

この発明の組成物の第1の必須成分はアニオン界面活性剤又は両性界面活性剤である。これらは、それぞれ同じ範疇内で2種以上を組み合わせ用いてもよい。

アニオン界面活性剤としては、通常シャンプーに用いられる任意のものでよい。その具体例を列挙すると次の通りである。

ラウリン酸のアルカリ金属塩又はアルカノールアミン塩；天然ラウリルアルコール3モルエトキシ

しみ」をなくし、ヘアースタイル剤を使用しなくても毛髪にしっとりとした、柔らかい感触と良好な梳毛性を付与し、乾燥時に起こりやすいヘアースタイル現象を未然に防止して、容易に整髪し得るコンディショニング効果を有すると共に、優れた養育毛効果を併せ持つシャンプー組成物を提供することである。

#### 〔発明の概要〕

すなわち、この発明は、（イ）アニオン界面活性剤又は両性界面活性剤を3ないし40重量％、（ロ）カチオン界面活性剤又はカチオン化密度が0.0005ないし0.005の第四級窒素含有水溶性ポリマーを0.1ないし5重量％、（ハ）奇数鎖長高級脂肪酸若しくは奇数鎖長高級脂肪酸アルコール又はこれらの誘導体を0.1ないし10重量％含むシャンプー組成物を提供する。

#### 〔発明の効果〕

この発明のシャンプー組成物は、シャンプーの基本性能である洗浄性に加えて、優れたヘアコンディショニング性と優れた養育毛効果を発揮す

硫酸エステル、オキシ法合成炭素数12～16脂肪酸アルコール3モルエトキシ硫酸エステル、オキシ法合成炭素数12～16脂肪酸アルコール1モルエトキシ硫酸エステルあるいは炭素数12～16脂肪酸アルコール硫酸エステル等のエステル類のアルカリ金属塩、アルカリ土類金属塩又はアルカノールアミン塩；ワックスクラッキング法、チーグラー触媒による重合法又はこれらの改良法により得られた炭素数12～14アルファオレフィン、炭素数12～16ビニリデンオレフィン及び炭素数12～16インナーオレフィンを三酸化硫黄等でスルホン化し、さらに加水分解して得られるアニオン界面活性剤のアルカリ金属塩、アルカリ土類金属塩又はアルカノールアミン塩；炭素数12～14アシルアミドポリグリコールエーテル（3～8モル）硫酸エステルのアルカリ金属塩、アルカリ土類金属塩又はアルカノールアミン塩。

両性界面活性剤も、通常シャンプーに用いられる任意のものでよい。その具体例を列挙すると次

の通りである。

ラウリルβ-イミノジプロピオネート；1-ラウリル-2-ヒドロキシ-2-ヒドロキシエチル-2-カルボキシメチル-エチレンシクロイミド；N-ラウロイル-N'-カルボキシメチル-N'-2-ヒドロキシエチルエチレンジアミン；N-ラウロイル-N-(2-ヒドロキシエチル)-N'-カルボキシメチルエチレンジアミン；N-ラウロイル-N-(2-ヒドロキシエチル)-N'-N'-ビス(カルボキシエチル)エチレンジアミン。

これらアニオン又は両性界面活性剤は、組成物全量に対し3ないし40重量%配合される。配合量が3重量%未満の場合には満足すべき洗浄力及び泡立性が得られなくなり、40重量%を超えると液安定性が損なわれて、寒冷環境下に保存した場合、濁りや分離が生じる。

この発明の第2の必須成分は、カチオン界面活性剤又はカチオン化密度が0.0005ないし0.005の第四級窒素含有水溶性ポリマーである。カチオン界面活性剤及び窒素含有水溶性ポリマーは、そ

$\text{-(CH}_2\text{CH(R}_6\text{)O)}_{n-5}\text{H}$  (ただし、 $R_6$ は水素又はメチル基)、ベンジル基、又はシンナミル基、 $R_3$ 及び $R_4$ は互いに独立に炭素数1ないし3のアルキル基、 $\text{-(CH}_2\text{CH(R}_6\text{)O)}_{n-5}\text{H}$  (ただし、 $R_6$ は上記のものと同じ)、ベンジル基、又はシンナミル基、Xはハロゲン原子又は炭素数1若しくは2のアルキル硫酸基を示す)

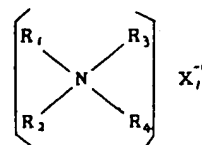
代表的な第四級アンモニウム塩は、ステアリルトリメチルアンモニウムクロリド、ジステアリルジメチルアンモニウムクロリド等である。

アミノ酸系カチオン界面活性剤の代表例として、モノN-長鎖アシル塩基性アミノ酸低級アルキルエステル塩を挙げることができる。モノN-長鎖アシル塩基性アミノ酸低級アルキルエステル塩を構成する塩基性アミノ酸としては、例えばオルニチン、リジン及びアルギニン等の天然アミノ酸を挙げることができる。また、例えばα、γ-ジアミノ酸のような合成アミノ酸も同様に

それぞれ同じ範疇内で2種以上を組合せて用いてもよい。

カチオン界面活性剤の例として第四級アンモニウム塩及びアミノ酸系カチオン界面活性剤を挙げることができる。第四級アンモニウム塩は、下記一般式(I)で表わされる。

一般式(I)



(ただし、 $R_1$ は炭素数10ないし24のアルキル基、炭素数10ないし24のヒドロキシル基、又は $R_5(\text{OCH}_2\text{CH}_2)_{1-10}$  (ただし、 $R_5$ は炭素数10ないし24のアルキル基又は炭素数10ないし24のヒドロキシル基)、 $R_2$ は炭素数10ないし24のアルキル基、炭素数10ないし24のヒドロキシル基、又は $R_5(\text{OCH}_2\text{CH}_2)_{1-10}$  (ただし $R_5$ は上記のものと同じ)、炭素数1ないし3のアルキル基、

用いることができる。これらは光活性体でもラセミ体でもよい。また、そのアシル基は、炭素数が8ないし22の飽和又は不飽和の脂肪酸残基である。これらは天然のものでも合成されたものでもよい。例えばラウロイル基、ミリストイル基、パルミトイル基、及びステアロイル基などの単一脂肪酸残基、並びにヤシ油脂肪酸残基及び牛脂脂肪酸残基などの天然の混合脂肪酸残基を採用することができる。低級アルキルエステル成分としては、メチルエステル、エチルエステル、プロピルエステル、ブチルエステル、ペンチルエステル、ヘキシルエステル、ヘプチルエステル及びオクチルエステルが適当である。その塩としては、例えば塩酸塩若しくは硫酸塩のような無機酸塩、又は、例えば酢酸塩、酒石酸塩、クエン酸塩、p-トルエンスルホン酸塩、脂肪酸塩、酸性アミノ酸塩、若しくはピログルタミン酸塩のような有機酸塩を採用することができる。これらのうち、塩酸塩、L又はDL-ピロリドンカルボン酸塩及び酸性アミノ酸塩の形が好ましい。

また、第四級窒素含有水溶性ポリマーは0.0005～0.005の範囲のカチオン化密度を有することが必要であり、分子量で規定すれば2000～300万の範囲のものが好ましい。ただし、ここで言うカチオン化密度は次式で定義される。

$$\text{カチオン化密度} = \frac{\text{第四級窒素原子の数}}{\text{第四級窒素含有水溶性ポリマーの分子量}}$$

上記第四級窒素含有水溶性ポリマーは、第四級窒素含有スターチ；第四級窒素含有ポリ（トリアルキルアミノエチルメタクリレート）；第四級窒素含有ビニルピロリドンコポリマー；等を含み、これらは2種以上を組合せて用いてもよい。このような第2の必須成分の化合物を得るためには、水溶性ポリマーを第四級窒素導入剤と反応させればよく、第四級窒素導入剤としては、例えばグリシジルトリメチルアンモニウムハライド又は3-ハロゲン-2-ヒドロキシプロピルトリアルキルアンモニウムハライド等が知られている。

0.1ないし3重量%の範囲である。0.1重量%未満では、しっとり感、なめらかさ等において、この発明の効果が得られない。5重量%を超えると毛髪がべたつき好ましくない。

この発明の組成物の第2の必須成分である奇数鎖長高級脂肪酸若しくは奇数鎖長高級脂肪族アルコール又はこれらの誘導体は、炭素鎖を構成している炭素原子の数が奇数のものであれば、その炭素鎖は飽和又は不飽和のものであってもかまわず、また不飽和鎖の場合、複数の二重結合を含んでいてもよい。また、炭素鎖は高級炭素鎖であり、その炭素数は少なくとも9個、好ましくは11ないし21個である。すなわち、この発明に用いるのに好ましい奇数鎖長高級脂肪酸はヘンデカン酸、トリデカン酸、ペンタデカン酸、ヘプタデカン酸、ノナデカン酸、ヘンエイコ酸であり、好ましい奇数鎖長高級脂肪族アルコールはウンデシルアルコール、トリデシルアルコール、ペンタデシルアルコール、ヘプタデシルアルコール、ノナデシルアルコール、ウンエイコシルアルコール

この発明の目的に好ましい第四級窒素含有水溶性ポリマーにつき、具体的な製造法を下に例示する。

その1：

分子量12万のヒドロキシエチルセルロース（グルコース単位2単位が反復構造の基本単位であるセルロースに酸化エチレンを1.7モル付加させたもの）80gと、グリシジルトリメチルアンモニウムクロリド30gとを溶媒中で反応させると、第四級窒素含有率2.1%、カチオン化密度0.0014の第四級窒素含有セルロースエーテルを87g程度得ることができる。

その2：

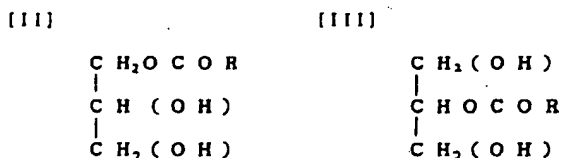
分子量20万の馬鈴薯デンプン80gとグリシジルトリメチルアンモニウムクロリド80gとを溶媒中で反応させると、第四級窒素含有率3.7%、カチオン化密度0.003の第四級窒素含有スターチを91g程度得ることができる。

上述した第2の必須成分の配合量は、組成物全量に対して0.1ないし5重量%、好ましくは

である。

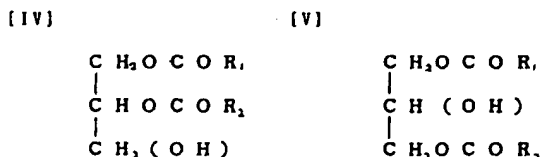
また、この発明の組成物に用いることができる奇数鎖長高級脂肪酸の好ましい誘導体の例として次のものを挙げることができる。

(イ) 下記一般式[II]又は[III]で示されるモノグリセライド



ここで、Rは偶数の炭素鎖長を有する直鎖式脂肪族基を表わす。

(ロ) 下記一般式[IV]又は[V]で示されるジグリセライド

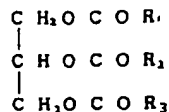


ここで、R<sub>1</sub>及びR<sub>2</sub>の少なくともいずれか一方は偶数の炭素鎖長を有する直鎖式脂肪族基を表わ

す。R<sub>1</sub>又はR<sub>2</sub>のいずれか一方が偶数の炭素鎖長を有する脂肪族基であればこの発明の効果は得られ、他の一方は奇数の炭素鎖長を有する脂肪族基又は人体に悪影響を与えることがない他の有機基であってもよい。しかしながら、奇数鎖長の脂肪酸ジグリセライドであることが特に好ましい。

(ハ) 下記一般式 [VI] で示されるトリグリセライド

[VI]



ここで、R<sub>1</sub>、R<sub>2</sub>及びR<sub>3</sub>のうち少なくとも1つは偶数の炭素鎖長を有する直鎖式脂肪族基を表わす。R<sub>1</sub>、R<sub>2</sub>及びR<sub>3</sub>のうち少なくともいずれか1つが偶数の炭素鎖長を有する脂肪族基であればこの発明の効果は得られ、他のものは奇数の炭素鎖長を有する脂肪族基又は人体に悪影響を与えることがない他の有機基であってもかまわない。しかしながら、奇数鎖長の脂肪酸のトリグリセライドが

(ヘ) 下記一般式 [IX] で表わされる第1アミド

[IX]



ここでRは偶数の炭素鎖長を有する直鎖式脂肪族基を表わす。R'及びR''は水素又は人体に悪影響を与えることがない有機基を表わす。

(ト) 下記一般式 [X] で表わされる第2アミド

[X]



ここでR<sub>1</sub>及びR<sub>2</sub>のうち少なくともどちらか一方は偶数の炭素鎖長を有する直鎖式脂肪族基を表わす。R<sub>1</sub>及びR<sub>2</sub>のうち少なくとも一方が偶数鎖長の脂肪族基であればこの発明の効果を得ることができ、他のもの及びR'は水素又は人体に悪影響を与えないどのような有機基であったもよい。もっとも、双方とも偶数鎖長の直鎖式脂肪族基であることが特に好ましい。

(チ) 下記一般式 [XI] で表わされる第3アミド

特に好ましい。

(ニ) 下記一般式 [VII] で示される脂肪酸塩

[VII]



ここで、Rは偶数の炭素鎖長を有する直鎖式脂肪族基、Mは金属原子、nはMの価数に対応した整数を表わす。代表的なものはRCOONa、RCOOK、及びRCOOLiなどである。

(ホ) 下記一般式 [VIII] で表わされるエステル

[VIII]



ここで、Rは偶数の炭素鎖長を有する直鎖式脂肪族基、R'は1価若しくは2価アルコール残基、アミン残基、ポリオキシエチレン残基、ソルビタン残基、又はシロキサン残基を表わす。1価アルコールの典型例はメタノール及びエタノールであり、アミン残基の典型例はモノ、ジ、トリエタノールアミンである。

[XI]



ここで、R<sub>1</sub>、R<sub>2</sub>及びR<sub>3</sub>のうち少なくとも1つは偶数の炭素鎖長を有する直鎖式脂肪族基を表わす。R<sub>1</sub>、R<sub>2</sub>及びR<sub>3</sub>のうち少なくとも1つが偶数鎖長の脂肪族基であればこの発明の効果を得ることができ、他のものは人体に悪影響を与えないものであればどのような有機基であってもよい。もっとも、これら3つとも偶数鎖長の直鎖式脂肪族基であることが特に好ましい。

(リ) 下記一般式 [XII] で表わされる二塩基酸及びその塩

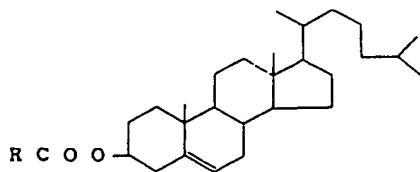
[XII]



ここで、Rは奇数の炭素鎖長を有する直鎖式脂肪族基を表わす。

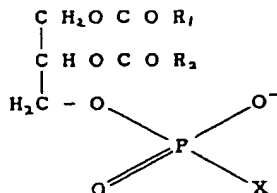
(ヌ) 下記一般式 [XIII] で表わされるステロールエステル

[XIII]



ここで、Rは偶数の炭素鎖長を有する直鎖式脂肪酸基を表わす。

(ル) 下記一般式[XIV]で表わされるリン脂質[XIV]

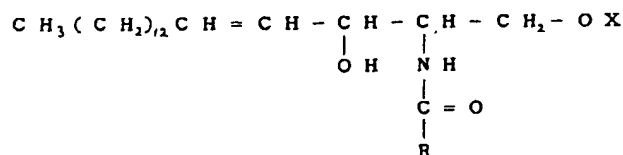


ここで、R<sub>1</sub>及びR<sub>2</sub>のうち少なくともいずれか一方が偶数の炭素鎖長を有する直鎖式脂肪酸基を表わす。R<sub>1</sub>及びR<sub>2</sub>のうちいずれか一方が偶数の炭素鎖長を有する脂肪酸基であれば、この発明の効果は得られ、他のものは奇数鎖長の脂肪酸基、又は

表わす。R<sub>1</sub>及びR<sub>2</sub>のうちいずれか一方が偶数の炭素鎖長を有する脂肪酸基であれば、この発明の効果は得られ、他のものは奇数鎖長の脂肪酸基、又は人体に悪影響を与えることがない他の有機基であってよい。もっとも、双方ともが偶数の炭素鎖長を有する直鎖式有機基であることが好ましい。

(ワ) 下記一般式[XVI]で表わされるスフィンゴ脂質

[XVI]



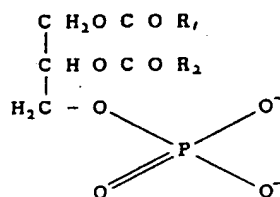
ここで、Rは偶数の炭素鎖長を有する直鎖式脂肪酸基、Xは糖残基、リン酸残基、又はコリン若しくはエタノールアミンのようなアミン塩基残基を表わす。

また、この発明の組成物に用いることができる奇数鎖長高級脂肪酸アルコールの好ましい誘導体の例として次のものを挙げることができる。

は人体に悪影響を与えることがない他の有機基であってよい。もっとも、双方ともが偶数の炭素鎖長を有する直鎖式脂肪酸基であることが好ましい。Xはコリン残基、エタノールアミン残基、セリン残基、又はイノシトール残基を表わす。Xがコリン残基のときはファスファチジルコリン、エタノールアミン残基のときはファスファチジルエタノールアミン、セリン残基のときはファスファチジルセリン、イノシトール残基のときはファスファチジルイノシトールとなる。

(ヲ) 下記一般式[XV]で表わされるファスファチジン酸

[XV]



ここで、R<sub>1</sub>及びR<sub>2</sub>のうち少なくともいずれか一方が偶数の炭素鎖長を有する直鎖式脂肪酸基を

(カ) 下記一般式[XVII]で表わされるエステル

[XVII]



ここでRは奇数鎖長アルコール残基を示す。R<sub>1</sub>は、脂肪酸残基（好ましくはC<sub>2</sub>~C<sub>24</sub>の鎖長を有するもの）；コハク酸、クエン酸、フマル酸、乳酸、ビルビン酸、リンゴ酸、オキサロ酢酸のような有機酸の残基；又は、リン酸等の無機酸の残基を示す。

(コ) 下記一般式[XVIII]で表わされるエーテル[XVIII]



ここで、Rは奇数鎖長アルコール残基を示す。R<sub>2</sub>は1価アルコール残基（好ましくはC<sub>2</sub>~C<sub>24</sub>の鎖長を有するもの）；グリセリン、ポリグリセリン、エチレングリコール、プロピレングリコール、ブタンジオールのような多価アルコールの残基；又はブドウ糖、リボース、ガラクトース、アラビノース、マンノース、キシロース、ソ

ルビトール、マンニトールのような糖の残基を示す。

奇数鎖長高級脂肪酸若しくは奇数鎖長高級脂肪酸アルコール又はこれらの誘導体は、通常、組成物全量に対し、0.1ないし10重量%、好ましくは1～5重量%含まれる。

この発明では、上述した必須成分の外に、任意成分として次のような成分を添加することができる。すなわち、任意成分としては、例えばラウロイルジエタノールアミド、食塩、芒硝等の増粘剤、乳濁剤、可溶化剤、非イオン界面活性剤、BHT、 $\alpha$ -トコフェロール等の酸化防止剤、紫外線吸収剤、タンパク誘導体、動植物抽出エキス、殺菌剤、色素、香料等を挙げることができる。

以下、この発明の実施例と比較例を示し、この発明の効果を具体的に説明する。各例の説明に先立ち、性能の評価方法を説明する。

#### [コンディショニング性]

試料組成物で10g、20cmの毛束を5回洗浄し、乾燥した後の毛束のべとつき具合、しっとり

感、なめらかさ、伸び（5回伸びずりして行なった）、及びまとまり易さ（伸びテストをした後に行なった）を10名のテスターにより官能評価し、下記の組成を有する対照組成物と比べて優れていれば○、同程度であれば△、劣っていれば×というように評価した。

#### 対照組成物の組成

$C_{12-15}$  脂肪酸アルコール3モルエトキシ硫酸エステル  
のナトリウム塩 15.0重量%  
トリデカン酸トリグリセライド 3.0重量%  
水 残部

[すすぎ時の「きしみ」のなさ]

頭髮を左右に二分し、試料3.0gと対照組成物3.0gを各々の頭髮にべつべつにとり、シャンプーを行ない、すすぎ洗いをした時の「きしみ」のなさを上記対照組成物との一対比較により評価した。この試験は50名のテスターにより行なった。対照組成物と比べてきしみのなさが優れていれば○、同程度であれば△、劣っていれば×というように評価した。

#### [養育毛効果]

体重約2.5kgのニュージーランドホワイト種雄ウサギ6ないし8羽を1群とし、背部を除毛し、休止期にあるもののみを実験に供した。休止期にあるものの除毛した背部に被験試料を各0.2mlずつ、週2回、30ないし60日間塗布し、休止期毛が成長期に変換するのに要する日数を調べた。養育毛効果の指標として用いた「促進日数」とは、被験物質を含まない組成物を塗布した場合に比べて、休止期毛から成長期毛への変換が何日間促進されたかを示すものである。なお、効果の判定は、促進日数が15日以上のもを著効、6日から14日のものを有効、5日以下のものを無効とした。

#### 実施例1～23 比較例1～7

下記表に示す組成を有する30種の試料を調製し、その性能を試験した。結果を同表に示す。なお、表中の配合量は全て重量%で示されており、また、表中の本1～本18は下記物質を示す。

- 本1：オキシ法合成 $C_{12-15}$ 脂肪酸アルコール3モルエトキシ硫酸エステルのナトリウム塩
- 本2：オキシ法合成 $C_{12-15}$ 脂肪酸アルコール3モルエトキシ硫酸エステルのマグネシウム塩
- 本3：ラウリル硫酸エステルのナトリウム塩
- 本4：ラウリル硫酸エステルのトリエタノールアミン塩
- 本5： $C_{14}$   $\alpha$ -オレフィンスルホン酸のナトリウム塩（分子量308）
- 本6：N-ラウロイル-N-(2-ヒドロキシエチル)-N'-カルボキシメチルエチレンジアミン
- 本7：ミラノールC2Mコンク（ミラノール社商標品名）
- 本8：ステアリルトリメチルアンモニウムクロリド
- 本9：ココイルアルギニンエチルエステルPCA塩
- 本10：第四級窒素含有セルロースエーテル（カチオン化密度0.0014、分子量12万）
- 本11：第四級窒素含有セルロースエーテル（カチオン化密度0.0005、分子量12万）

- \*12: 第四級窒素含有セルロースエーテル (カチオン化密度0.0001、分子量12万)
- \*13: 第四級窒素含有スターチ (カチオン化密度0.003、分子量20万)
- \*14: 第四級窒素含有ビニルピロリドンコポリマー (カチオン化密度0.002、分子量40万)
- \*15: ペンタデカン酸モノグリセライド
- \*16: トリデカン酸トリグリセライド
- \*17: ノナイン酸
- \*18: ヘンデカン酸ジエチルアミド

表

| 実施例<br>比較例 |  | 例 |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |   |   |   |   | 18 |   | 19 |   | 20 |   |   |   | 21 |   |   |   | 22 |   |   |   | 23 |   |   |   | 7 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
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|            |  | 1 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 3 | 4 | 5 | 6 | 1  | 2 | 3  | 4 | 5  | 6 | 1 | 2 | 3  | 4 | 5 | 6 | 1  | 2 | 3 | 4 | 5  | 6 | 1 | 2 |   | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |

**Japanese Patent Application,  
Second Publication No. Hei 5-44444**

Second Publication Date: July 6, 1993

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Application No.: Sho 59-274947  
Application Date: December 28, 1984  
First Publication No.: Sho 61-155311  
First Publication Date: July 15, 1986  
Applicant: Lion KK  
Inventors: Zentaro Shinjo  
Takashi Ikeuchi  
Int. Cl.<sup>6</sup>: A61K 7/075

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Ex 11 et 16

**[TITLE OF THE INVENTION]**

**SHAMPOO COMPOSITION**

**[Claim 1]**

A shampoo composition comprising  
of an anionic or amphoteric surfactant, (b) 0.1-5 %  
by weight of a cationic surfactant or a water-soluble  
polymer containing a quaternary nitrogen with a  
cationization density of 0.0005-0.005, and (c)

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0.1-10 % by weight of a higher fatty acid having a chain length of odd number, or higher aliphatic alcohol having a chain length of odd number or derivative thereof.

[Detailed Description of the Invention]

[Field of Industrial Application]

The present invention relates to a shampoo composition and, more particularly, to a shampoo composition having hair-nourishing and conditioning effects.

[Prior Art]

To cosmetic compositions such as a hair-nourishing composition, various pharmaceutically active agents whose hair-nourishing and hair-growing effects are expected have hitherto been formulated. As the pharmaceutically active agent, for example, vitamins such as vitamin E, amino acids such as serine and methionine, vasodilators such as acetylcholine derivative, anti-inflammatory drugs such as lithospermum root extract, female sex hormones such as estradiol, skin hyperergasia drugs such as cepharanthin, melanin synthesis catalysts such as copper pantothrinate and keratolytics such as

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salicylic acid are formulated and used for prevention and treatment of alopecia.

Examples wherein fatty acid or a derivative thereof is formulated in hair cosmetic compositions such as hair-nourishing composition include those wherein natural vegetable oils such as olive oil and castor oil or stearic acid are formulated for the purpose of improving physical properties of products. However, almost all of them are fatty acids having a carbon chain length of an even number. Accordingly, there are no examples wherein a fatty acid having an odd carbon number or a derivative thereof is formulated in cosmetic compositions for the purpose of hair-nourishing and hair-growing in a conventional commercially available product. Also with respect to a higher alcohol to be formulated in hair cosmetic compositions such as hair rinse, all of those which have hitherto been commercially available are alcohols having a carbon chain length of an even number or derivatives thereof and there are no examples wherein an alcohol having a chain length of an odd number is used as a hair-growing component.

According to Japanese Patent application, First

Publication No. Sho 59-27809, it has been found that a fatty acid having a chain length of an odd number or a derivative thereof has a hair-growing effect unlike those having a chain length of an even number, thus suggesting a shampoo composition containing a fatty acid having a chain length of an odd number or a derivative thereof as an active component.

[Problems of Prior Art]

However, such a shampoo composition has a drawback that a creaky feel referred generally to as "creakiness" remains after washing and rinsing of the hair and, therefore, the hair-combing property (hair-combing or hair-brushing) is poor when the hair is not sufficiently dried after towel drying. Furthermore, when the hair is completely dried, the hair-dressing and hair-combing properties are poor. In the low-humidity season, static electricity is liable to be caused by brushing, resulting in flying of the hair, that is, hair-fly and inferior hair-combing.

[Object of the Invention]

An object of the present invention is to provide a shampoo composition which prevents "creakiness" at the time of hair washing and rinsing and imparts

moistness and softness as well as good hair-combing property to the hair even if a hair rinse agent is not used, and which has a hair-conditioning effect capable of preventing a hair-fly phenomenon, which is liable at the time of drying, to easily dress the hair, and has an excellent hair-nourishing effect.

[Summary of the Invention]

That is, the present invention provides a shampoo composition comprising (a) 3-40% by weight of an anionic or amphoteric surfactant, (b) 0.1-5% by weight of a cationic surfactant or a water-soluble polymer containing a quaternary nitrogen with a cationization density of 0.0005-0.005, and (c) 0.1-10% by weight of a higher fatty acid having a chain length of an odd number, or a higher aliphatic alcohol having a chain length of an odd number or a derivative thereof.

[Effect of the Invention]

A shampoo composition of the present invention can exert an excellent hair-conditioning effect and an excellent hair-nourishing/growing effect, in addition to a cleaning action as a fundamental performance. That is, when using for cleaning of the hair, the shampoo composition exerts a high foaming

action and a moderate cleaning action. At the time of rinsing, "creakiness" is inhibited. In case of hair finishing, the shampoo composition imparts good hair-dressing property, no stickiness, wiry/moist finishing and good hair-combing property. Furthermore, it prevents a hair-fly at the time of drying. A higher fatty acid having a chain length of an odd number or a higher aliphatic alcohol having a chain length of an odd number, or a derivative thereof penetrates satisfactorily into the hair root from the scalp, thereby exerting an excellent hair-nourishing/growing effect.

[Detailed Description of the Invention]

A first essential component of the composition according to the present invention is an anionic surfactant or an amphoteric surfactant. Two or more kinds of these surfactants may be used in combination within the same range.

The anionic surfactant may be any one which is normally used in the shampoo. Specific examples thereof include:

alkaline metal salt or alkanolamine salt of lauric acid; alkaline metal salt, alkaline earth metal salt or alkanolamine salt of esters such as

natural lauryl alcohol (3mol)ethoxysulfate, oxo-process-synthesized  $C_{12-16}$  aliphatic alcohol (3 mol)ethoxysulfate, oxo-process-synthesized  $C_{12-16}$  aliphatic alcohol (1mol)ethoxysulfate or  $C_{12-16}$  aliphatic alcohol sulfate; alkaline metal salt, alkaline earth metal salt or alkanolamine salt of anionic surfactant obtained by sulfonating  $C_{12-14}$  alpha-olefin,  $C_{12-16}$  vinylidene-olefin and  $C_{12-16}$  inner-olefin obtained by a wax lacking process, a polymerization process using a Zielger-Natta catalyst or an improved process thereof, followed by hydrolysis; and alkaline metal salt, alkaline earth metal or alkanolamine salt of  $C_{12-14}$  acylamide polyglycol ether (3-8 mol)sulfate.

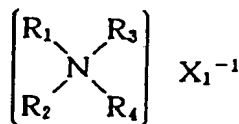
The amphoteric surfactant may also be any one which is normally used in the shampoo. Specific examples thereof include:

lauryl-  $\beta$  -iminodipropionate; 1-lauryl-2-hydroxy-2-hydroxyethyl-2-carboxymethyl-ethylenecycloimide; N-lauroyl-N'-carboxymethyl-N'-2-hydroxyethylenediamine; N-lauroyl-N-(2-hydroxyethyl)-N'-carboxymethylenediamine; and N-lauroyl-N-(2-hydroxyethyl)-N'-N'-bis(carboxyethyl)ethylenediamine.

These anionic or amphoteric surfactants may be formulated in an amount of 3 to 40% by weight based on the total amount of the composition. When the amount is less than 3% by weight, it becomes impossible to obtain satisfactory cleaning and foaming actions. On the other hand, when the amount exceeds 40% by weight, the stability is deteriorated and turbidity and separation occur during the storage under a cool environment.

A second essential component of the present invention is a cationic surfactant or a water-soluble polymer containing a quaternary nitrogen with a cationization density of 0.0005 to 0.005. Two or more kinds of cationic surfactants or water-soluble nitrogen-containing polymers may be respectively used in combination within the same range.

Examples of the cationic surfactant include quaternary ammonium salt and amino acid cationic surfactant. The quaternary ammonium salt is represented by the following general formula [I].  
General formula [I]:



(wherein  $R_1$  is an alkyl group having 10 to 24 carbon atoms, a hydroxyalkyl group having 10 to 24 carbon atoms, or  $R_5(OCH_2CH_2)_{1-10}$  ( $R_5$  is an alkyl group having 10 to 24 carbon atoms, or a hydroxyalkyl group having 10 to 24 carbon atoms);  $R_2$  is an alkyl group having 10 to 24 carbon atoms, a hydroxyalkyl group having 10 to 24 carbon atoms,  $R_5(OCH_2CH_2)_{1-10}$  ( $R_5$  is as defined above), an alkyl group having 1 to 3 carbon atoms,  $\begin{array}{c} \text{-(CHCH}_2\text{O)-}_{1-5}\text{H} \\ | \\ R_6 \end{array}$  ( $R_6$  is hydrogen or a methyl group), a benzyl group, or a cinnamyl group;  $R_3$  and  $R_4$  are independent each other, an alkyl group having 1 to 3 carbon atoms,  $\begin{array}{c} \text{-(CHCH}_2\text{O)-}_{1-5}\text{H} \\ | \\ R_6 \end{array}$  ( $R_6$  is as defined above), a benzyl group, or a cinnamyl group; and X is a halogen atom, or an alkyl sulfuric group having 1 or 2 carbon atoms)

A typical quaternary ammonium salt includes stearyl trimethylammonium chloride and distearyl dimethylammonium chloride.

Typical examples of the amino acid cationic surfactant include mono-N-long-chain-acyl basic amino acid lower alkyl ester salt. Examples of the basic amino acid constituting the mono-N-long-chain-acyl basic amino acid lower alkyl ester salt include natural amino acid such as ornithin, lysine and

arginine. Synthetic amino acid such as  $\alpha$ ,  $\gamma$ -diaminoacetic acid can also be used. These amino acid may be an optically active substance or a racemic configuration. An acyl group thereof is a saturated or unsaturated fatty acid residue having 8 to 22 carbon atoms. These residues may be natural or synthetic. For example, there can be employed a single fatty acid residue such as lauroyl group, myristoyl group, palmitoyl group and stearyl group, and a natural mixed fatty acid residue such as coconut oil fatty acid residue and beef tallow fatty acid residue. As the lower alkyl ester component, for example, methyl ester, ethyl ester, propyl ester, butyl ester, pentyl ester, hexyl ester, heptyl ester and octyl ester are suitable. As the salt thereof, for example, an inorganic acid salt such as chloride or sulfate, or an organic acid salt such as acetate, tartrate, citrate, p-toluenesulfonate, fatty acid salt, acidic amino acid salt or polyglutamate can be employed. Among them, the form of hydrochloride, L- or DL-pyrrolidonecarboxylate and acidic amino acid salt is preferred.

It is necessary that the water-soluble polymer containing a quaternary nitrogen has a cationization

density within the range from 0.0005 to 0.005. Those having a molecular weight within the range from 2,000 to 3,000,000 are preferred. The cationization density used herein is defined by the following equation:

Cationization density = (Number of quaternary nitrogen atoms)/(molecular weight of water-soluble polymer containing a quaternary nitrogen)

The water-soluble polymer containing a quaternary nitrogen includes starch containing a quaternary nitrogen, poly(trialkylaminoethyl methacrylate) containing a quaternary nitrogen and vinyl pyrrolidone copolymer containing a quaternary nitrogen, and two or more kinds of them may be used in combination. To obtain a compound of the second essential component, the water-soluble polymer may be reacted with a quaternary nitrogen introducing agent. As the quaternary nitrogen introducing agent, for example, glycidyl trimethylammonium halide or 3-halogeno-2-hydroxypropyltrialkylammonium halide is known.

With respect to the water-soluble polymer containing a quaternary nitrogen suited for the object of the present invention, its specific

production method will be illustrated below.

Method 1:

By reacting 80 g of hydroxyethylcellulose having a molecular weight of 120,000 (obtained by adding 1.7 mol of ethylene oxide to cellulose having two glucose units as a base unit) with 30 g of glycidyl trimethylammonium chloride in a solvent, about 97 g of cellulose ether containing a quaternary nitrogen, which has a quaternary nitrogen content of 2.1% and a cationization density of 0.0014, can be obtained.

Method 2:

By reacting 60 g of potato starch having a molecular weight of 200,000 with 80 g of glycidyl trimethylammonium chloride in a solvent, about 91 g of starch containing a quaternary nitrogen, which has a quaternary nitrogen content of 3.7% and a cationization density of 0.003, can be obtained.

The amount of the second essential component described above is within the range from 0.1 to 5% by weight, and preferably from 0.1 to 3% by weight, based on the total amount of the composition. When the amount is less than 0.1% by weight, the effect of the present invention can not be obtained in moistness and smoothness. On the other hand, when

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the amount exceeds 5% by weight, the hair becomes sticky and it is not preferred.

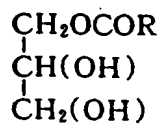
The higher fatty acid having a chain length of an odd number, or the higher aliphatic alcohol having a chain length of an odd number or the derivative thereof, which is the second essential component of the composition according to the present invention, may be those wherein the carbon chain is saturated or unsaturated and a plurality of double bonds may be contained in case of an unsaturated chain, as far as the number of carbon atoms constituting the carbon chain is an odd number. The carbon chain is a higher carbon chain and the number of carbon atoms is at least 9, and preferably from 11 to 21. Preferred higher fatty acid having a chain length of an odd number used in the present invention includes hendecanoic acid, tridecanoic acid, pentadecanoic acid, heptadecanoic acid, nonadecanoic acid and heneicosanoic acid. Preferred higher aliphatic alcohol having a chain length of an odd number includes undecyl alcohol, tridecyl alcohol, pentadecyl alcohol, heptadecyl alcohol, nonadecyl alcohol and uneicosyl alcohol.

Examples of the preferred derivative of higher fatty acid having a chain length of an odd number,

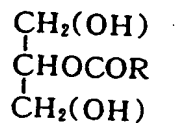
which can be used in the composition of the present invention, include the followings.

(i) Monoglyceride represented by the following general formula [II] or [III]:

[II]



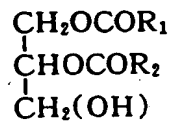
[III]



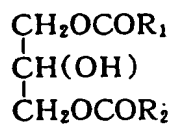
In the above formulas, R is a straight-chain aliphatic group having a carbon chain length of an even number.

(ii) Diglyceride represented by the following general formula [IV] or [V]:

[IV]



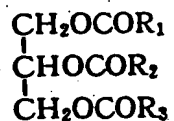
[V]



In the above formulas, at least one of  $R_1$  and  $R_2$  is a straight-chain aliphatic group having a carbon chain length of an even number. When at least one of  $R_1$  and  $R_2$  is a straight-chain aliphatic group having a carbon chain length of an even number, the effect of the present invention can be obtained and the other one may be an aliphatic group having a carbon chain length of an odd number or other organic groups which do not exert an adverse influence on a human body. However, diglyceride of a fatty acid having a chain length of an odd number is particularly preferred.

(iii) Triglyceride represented by the following general formula [VI]

[VI]



In the above formulas, at least one of  $R_1$ ,  $R_2$  and  $R_3$  is a straight-chain aliphatic group having a carbon chain length of an even number. When at least one of  $R_1$ ,  $R_2$  and  $R_3$  is a straight-chain aliphatic group having a carbon chain length of an even number, the effect of the present invention can be obtained and

the other one may be an aliphatic group having a carbon chain length of an odd number or other organic groups which do not exert an adverse influence on a human body. However, triglyceride of a fatty acid having a chain length of an odd number is particularly preferred.

(iv) Fatty acid salt represented by the following general formula [VII]:

[VII]



In the above formula, R is a straight-chain aliphatic group having a carbon chain length of an even number; M is a metal atom; and n is an integer corresponding to a valency of M. Typical examples thereof include RCOONa, RCOOK and RCOOLi.

(v) Ester represented by the following general formula [VIII]:

[VIII]



In the above formula, R is a straight-chain aliphatic group having a carbon chain length of an even number; and R' is a monovalent or divalent alcohol residue, an amine residue, a polyoxyethylene residue, a sorbitan residue, or a sucrose residue.

Typical examples of the monovalent alcohol include methanol and ethanol, and typical examples of the amine residue include mono-, di- and triethanolamine.

(vi) Primary amide represented by the following general formula [IX]:

[IX]



In the above formula, R is a straight-chain aliphatic group having a carbon chain length of an even number; and R' and R'' are respectively a hydrogen or an organic group which do not exert an adverse influence on a human body.

(vii) Secondary amide represented by the following general formula [X]:

[X]



In the above formula, at least one of R<sub>1</sub> and R<sub>2</sub> is a straight-chain aliphatic group having a carbon chain length of an even number. When at least one of R<sub>1</sub> and R<sub>2</sub> is a straight-chain aliphatic group having a carbon chain length of an even number, the effect of the present invention can be obtained and the other one and R' may be hydrogen, or an organic group which

do not exert an adverse influence on a human body. It is particularly preferred that both of them are a straight-chain aliphatic group having a chain length of an even number.

(viii) Tertiary amide represented by the following general formula [XI]:

[XI]



In the above formula, at least one of  $R_1$ ,  $R_2$  and  $R_3$  is a straight-chain aliphatic group having a carbon chain length of an even number. When at least one of  $R_1$ ,  $R_2$  and  $R_3$  is a straight-chain aliphatic group having a carbon chain length of an even number, the effect of the present invention can be obtained and other ones may be any organic group which do not exert an adverse influence on a human body. It is particularly preferred that three of them are a straight-chain aliphatic group having a chain length of an even number.

(xi) Dibasic acid represented by the following general formula [XII] and salt thereof:

[XII]

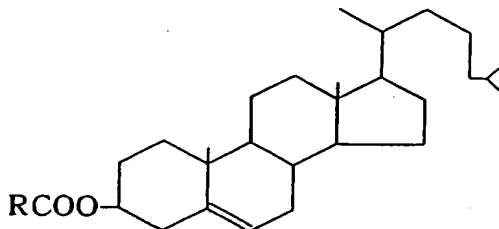


In the above formula, R is a straight-chain

aliphatic group having a carbon chain length of an odd number.

(x) Sterol ester represented by the following general formula [XIII] and salt thereof:

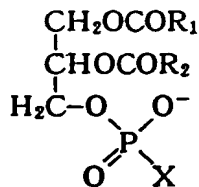
[XIII]



In the above formula, R is a straight-chain aliphatic group having a carbon chain length of an even number.

(xi) Phospholipid represented by the following general formula [XIV]:

[XIV]

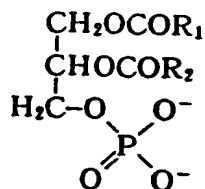


In the above formula, at least one of  $R_1$  and  $R_2$  is a straight-chain aliphatic group having a carbon chain length of an even number. When at least one of  $R_1$  and  $R_2$  is a straight-chain aliphatic group having a carbon chain length of an even number, the effect of the present invention can be obtained and the other one may be an aliphatic group having a carbon chain

length of an odd number or other organic group which do not exert an adverse influence on a human body. It is particularly preferred that both of them are a straight-chain aliphatic group having a chain length of an even number. X is a silicon residue, an ethanolamine residue, a serine residue, or an inositol residue. When X is a choline residue, the phospholipid is phosphatidylcholine. When X is an ethanolamine residue, it is phosphatidylethanolamine. When X is a serine residue, it is phosphatidylserine. When X is an inositol residue, it is phosphatidylinositol.

(xii) Phosphatidic acid represented by the following general formula [XV]:

[XV]

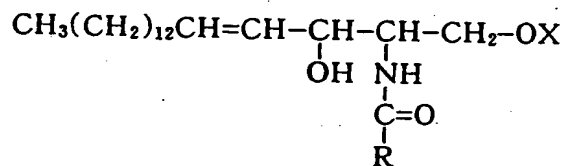


In the above formula, at least one of  $R_1$  and  $R_2$  is a straight-chain aliphatic group having a carbon chain length of an even number. When at least one of  $R_1$  and  $R_2$  is a straight-chain aliphatic group having a carbon chain length of an even number, the effect of the present invention can be obtained and the other

one may be an aliphatic group having a chain length of an odd number, or other organic group which do not exert an adverse influence on a human body. It is particularly preferred that both of them are a straight-chain aliphatic group having a chain length of an even number.

(xiii) Sphingolipid represented by the following general formula [XVI]:

[XVI]

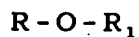


In the above formula, R is a straight-chain aliphatic group having a carbon chain length of an even number; and X is a saccharide residue, phosphoric residue, choline, or an amine base residue such as ethanolamine.

Examples of the preferred derivative of the higher aliphatic alcohol having a chain length of an odd number, which can be used in the composition of the present invention, include the followings.

(xiv) Ester represented by the following general formula [XVII]:

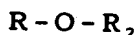
[XVII]



In the above formula, R is an alcohol residue having a chain length of an odd number; and  $R_1$  is a resin acid residue (preferably one having a  $C_2$ - $C_{24}$  chain length), a residue of organic acid such as succinic acid, citric acid, fumaric acid, lactic acid, pyruvic acid, malic acid and oxaloacetic acid, or a residue of an inorganic acid such as phosphoric acid.

(xv) Ether represented by the following general formula [XVIII]:

[XVIII]



In the above formula, R is an alcohol residue having a chain length of an odd number; and  $R_2$  is a monohydric alcohol residue (preferably one having a  $C_2$ - $C_{24}$  chain length), a residue of a polyhydric alcohol such as glycerin, polyglycerin, ethylene glycol, propylene glycol and butanediol, or a residue of a saccharide such as glucose, ribose, galactose, arabinose, mannose, xylose, sorbitol and mannitol.

The higher fatty acid having a chain length of an odd number, or the higher aliphatic alcohol having a chain length of an odd number or the derivative thereof is normally contained in an amount within the

range from 0.1 to 10% by weight, and preferably from 1 to 5% by weight.

In the present invention, the following components can be added as an optional component, in addition to the essential components described above. That is, the optional component includes, for example, thickeners such as lauroyldiethanolamide, sodium chloride and mirabilite; emulsifiers; solubilizers; nonionic surfactants; antioxidants such as BHT and  $\alpha$ -tocopherol; ultraviolet absorbers; protein derivatives; animal/vegetable extracts; disinfectants; pigments; and perfumes.

The following examples and comparative examples further illustrate the effect of the present invention in detail. Before the description of the respective examples, methods for evaluation of performances will be described.

[Conditioning effect]

A lock of hair (10 g, 20 cm) was washed five times with each sample composition and dried. Then, the stickiness, moistness, smoothness, hair-combing property (performed by combing five times) and easiness of hair-dressing (performed after the combing test) of the lock of hair were

organoleptically evaluated by ten testers. The evaluation was performed according to the following criteria.

○: Superior to a control composition having the following formulation

△: Same

×: Inferior

Formulation of the control composition

|  |                 |
|--|-----------------|
| Sodium salt of C <sub>12-15</sub> aliphatic alcohol (3 mol)ethoxysulfate | 15.0% by weight |
| Triglyceride tridecanoate  | 3.0% by weight  |
| Water  | qs(100%)        |

[Creakiness at the time of rinsing]

The hair was parted in the middle and 3.0 g of each test sample and 3.0 g of a control composition were separately applied on each hair, followed by shampooing and further rinsing. The "creakiness" was evaluated by comparing with the control composition. This test was performed by fifty testers according to the following criteria.

○: Superior to the control composition

△: Same

×: Inferior

[Hair-nourishing/growing effect]

Using a group of 6-8 New Zealand White derivation male rabbits having a weight of about 2.5 kg each, the body hair of the back region was removed and only rabbits in the resting stage were supplied to the test. Each test sample (0.2 ml) was applied on the back portion, where the body hair was removed, of rabbits in the resting stage twice a week for 30 to 60 days. Then, the day required for body hair in the resting stage to be replaced by the hair in the growing stage was examined. The "number of days accelerated" used as an index of the hair-nourishing/growing effect indicates the number of days accelerated for the hair in the resting stage to connect into the growing stage in comparison with the case where a composition containing no tested substance. The effect was judged according to the following criteria.

Remarkably effective: number of days accelerated is not less than 15 days

Effective: number of days accelerated is from 6 to 14 days

Ineffective: number of days accelerated is not more than 5 days.

Examples 1-23 and Comparative Examples 1-7

Thirty kinds of samples of the formulations shown in the following table were prepared and their performances were tested. The results are shown in the same table. In the table, the amount of all components is % by weight. The symbols \*1 to \*18 in the table are the following substances.

- \*1: Sodium salt of oxo-process-synthesized  $C_{12-13}$  aliphatic alcohol (3mol)ethoxysulfate
- \*2: Magnesium salt of oxo-process-synthesized  $C_{12-13}$  aliphatic alcohol (3mol)ethoxysulfate
- \*3: Sodium salt of lauryl sulfate
- \*4: Triethanolamine salt of lauryl sulfate
- \*5: Sodium salt of  $C_{14}$   $\alpha$  -olefinsulfonic acid (molecular weight: 308)
- \*6: N-Lauroyl-N-(2-hydroxyethyl)-N'-carboxymethylethylenediamine
- \*7: Milanol C2M Conc. (trade name of Milanol Co.)
- \*8: Stearyltrimethylammonium chloride
- \*9: Cocoylarginine ethyl ester PCA salt
- \*10: Cellulose ether containing a quaternary nitrogen (cationization density: 0.0014, molecular weight: 120,000)
- \*11: Cellulose ether containing a quaternary nitrogen (cationization density: 0.0005, molecular

weight: 120,000)

\*12: Cellulose ether containing a quaternary nitrogen (cationization density: 0.0001, molecular weight: 120,000)

\*13: Starch containing a quaternary nitrogen (cationization density: 0.003, molecular weight: 200,000)

\*14: Polyvinyl pyrrolidone copolymer containing a quaternary nitrogen (cationization density: 0.002, molecular weight: 40,000)

\*15: Monoglyceride pentadecanoate

\*16: Triglyceride tridecanoate

\*17: Inaic acid

\*18: Diethylamide hendecanoate

Table 1

|             | Example No.   |    |     | 1   | 2        | 3   | 4   | 5   | 6   |
|-------------|---|----|-----|-----|----------|-----|-----|-----|-----|
|             | Comparative Example No.   | 1  | 2   |     |          |     |     |     |     |
| Components  | Surfactant A*1  | 15 | 15  | 15  | 15       | 15  | 15  |     |     |
|             | Surfactant B*2  |    |     |     |          |     |     | 15  |     |
|             | Surfactant C*3  |    |     |     |          |     |     |     | 15  |
|             | Surfactant D*4  |    |     |     |          |     |     |     |     |
|             | Surfactant E*5  |    |     |     |          |     |     |     |     |
|             | Surfactant F*6  |    |     |     |          |     |     |     |     |
|             | Surfactant G*7  |    |     |     |          |     |     |     |     |
|             | Surfactant H*8  |    |     |     |          |     |     |     |     |
|             | Surfactant I*9  |    |     |     |          |     |     |     |     |
|             | Polymer containing quaternary nitrogen A*10                             |    |     | 1.0 | 1.0      | 1.0 | 1.0 | 1.0 | 1.0 |
|             | Polymer containing quaternary nitrogen B*11                             |    |     |     |          |     |     |     |     |
|             | Polymer containing quaternary nitrogen C*12                             |    |     |     |          |     |     |     |     |
|             | Polymer containing quaternary nitrogen D*13                             |    |     |     |          |     |     |     |     |
|             | Polymer containing quaternary nitrogen E*14                             |    |     |     |          |     |     |     |     |
|             | Fatty acid having chain length of odd number or derivative thereof A*15 |    | 3.0 | 3.0 | 3.0      |     |     | 3.0 | 3.0 |
|             | Fatty acid having chain length of odd number or derivative thereof B*16 |    |     |     |          | 3.0 |     |     |     |
|             | Fatty acid having chain length of odd number or derivative thereof C*17 |    |     |     |          |     | 3.0 |     |     |
|             | Fatty acid having chain length of odd number or derivative thereof D*18 |    |     |     |          |     |     |     |     |
|             | Lauroylmonoethanolamide   |    |     |     | 3.0      |     |     |     |     |
|             | Sodium chloride   |    |     |     | 1.0      |     |     |     |     |
|             | Water   |    |     |     | qs(100%) |     |     |     |     |
| Performance | Number of days accelerated  | 0  | 8   | 15  | 15       | 12  | 10  | 15  | 14  |
|             | Hair-nourishing/growing effect  | ×  | ○   | ◎   | ◎        | ○   | ○   | ◎   | ○   |
|             | Stickness of hair   | ○  | ○   | ○   | ○        | ○   | ○   | ○   | ○   |
|             | Moistness of hair   | ×  | ×   | ○   | ○        | ○   | ○   | ○   | ○   |
|             | Smoothness of hair  | ×  | ×   | ○   | ○        | ○   | ○   | ○   | ○   |
|             | Hair-combing property   | ×  | ×   | ○   | ○        | ○   | ○   | ○   | ○   |
|             | Easiness of hairdressing  | ×  | ×   | ○   | ○        | ○   | ○   | ○   | ○   |
|             | Creakiness at the time of rinsing                                       | ×  | ×   | ○   | ○        | ○   | ○   | ○   | ○   |

Table 1 (continued)

| Example No.             |   | 7   | 8   | 9   | 10       | 11  | 12  | 13  | 14  |
|-------------------------|---|-----|-----|-----|----------|-----|-----|-----|-----|
| Comparative Example No. |   |     |     |     |          |     |     |     |     |
| Components              | Surfactant A*1  |     |     |     |          |     |     |     |     |
|                         | Surfactant B*2  |     |     |     |          | 10  | 15  | 15  | 15  |
|                         | Surfactant C*3  |     |     |     |          |     |     |     |     |
|                         | Surfactant D*4  | 15  |     |     |          |     |     |     |     |
|                         | Surfactant E*5  |     | 15  |     |          |     |     |     |     |
|                         | Surfactant F*6  |     |     | 15  |          |     |     |     |     |
|                         | Surfactant G*7  |     |     |     | 15       | 5   |     |     |     |
|                         | Surfactant H*8  |     |     |     |          |     |     |     |     |
|                         | Surfactant I*9  |     |     |     |          |     |     |     | 1.0 |
|                         | Polymer containing quaternary nitrogen A*10                             | 1.0 | 1.0 | 1.0 | 1.0      | 1.0 |     |     |     |
|                         | Polymer containing quaternary nitrogen B*11                             |     |     |     |          |     |     |     |     |
|                         | Polymer containing quaternary nitrogen C*12                             |     |     |     |          |     |     |     |     |
|                         | Polymer containing quaternary nitrogen D*13                             |     |     |     |          |     | 1.0 |     |     |
|                         | Polymer containing quaternary nitrogen E*14                             |     |     |     |          |     |     | 1.0 |     |
|                         | Fatty acid having chain length of odd number or derivative thereof A*15 | 3.0 | 3.0 | 3.0 | 3.0      | 3.0 | 3.0 | 3.0 |     |
|                         | Fatty acid having chain length of odd number or derivative thereof B*16 |     |     |     |          |     |     |     |     |
|                         | Fatty acid having chain length of odd number or derivative thereof C*17 |     |     |     |          |     |     |     |     |
|                         | Fatty acid having chain length of odd number or derivative thereof D*18 |     |     |     |          |     |     |     | 3.0 |
|                         | Lauroylmonoethanolamide   |     |     |     |          |     |     |     |     |
|                         | Sodium chloride   |     |     |     |          |     |     |     |     |
|                         | Water   |     |     |     | qs(100%) |     |     |     |     |
| Performances            | Number of days accelerated  | 14  | 14  | 15  | 15       | 15  | 14  | 14  | 15  |
|                         | Hair-nourishing/growing effect  | ○   | ○   | ◎   | ◎        | ◎   | ○   | ○   | ◎   |
|                         | Stickiness of hair  | ○   | ○   | ○   | ○        | ○   | ○   | ○   | ○   |
|                         | Moistness of hair   | ○   | ○   | ○   | ○        | ○   | ○   | ○   | ○   |
|                         | Smoothness of hair  | ○   | ○   | ○   | ○        | ○   | ○   | ○   | ○   |
|                         | Hair-combing property   | ○   | ○   | ○   | ○        | ○   | ○   | ○   | ○   |
|                         | Easiness of hairdressing  | ○   | ○   | ○   | ○        | ○   | ○   | ○   | ○   |
|                         | Creakiness at the time of rinsing                                       | ○   | ○   | ○   | ○        | ○   | ○   | ○   | ○   |

Table 1 (continued)

|  | Example No.   | 15  | 16  | 17       |          | 18  |      | 19  |     |
|--|---|-----|-----|----------|----------|-----|------|-----|-----|
|  | Comparative Example No.   |     |     |          | 3        |     | 4    |     | 5   |
|  | Surfactant A*1  | 15  | 10  | 15       | 15       | 15  | 15   | 15  | 15  |
|  | Surfactant B*2  |     |     |          |          |     |      |     |     |
|  | Surfactant C*3  |     |     |          |          |     |      |     |     |
|  | Surfactant D*4  |     |     |          |          |     |      |     |     |
|  | Surfactant E*5  |     |     |          |          |     |      |     |     |
|  | Surfactant F*6  |     |     |          |          |     |      |     |     |
|  | Surfactant G*7  |     | 5   |          |          |     |      |     |     |
|  | Surfactant H*8  |     |     |          |          |     |      |     |     |
|  | Surfactant I*9  | 1.0 | 0.5 |          |          |     |      |     |     |
|  | Polymer containing quaternary nitrogen A*10                             |     | 0.5 | 0.0<br>5 | 0.01     | 5.0 | 10.0 |     |     |
|  | Polymer containing quaternary nitrogen B*11                             |     |     |          |          |     |      | 1.0 |     |
|  | Polymer containing quaternary nitrogen C*12                             |     |     |          |          |     |      |     | 1.0 |
|  | Polymer containing quaternary nitrogen D*13                             |     |     |          |          |     |      |     |     |
|  | Polymer containing quaternary nitrogen E*14                             |     |     |          |          |     |      |     |     |
|  | Fatty acid having chain length of odd number or derivative thereof A*15 | 3.0 | 3.0 | 3.0      | 3.0      | 3.0 | 3.0  | 3.0 | 3.0 |
|  | Fatty acid having chain length of odd number or derivative thereof B*16 |     |     |          |          |     |      |     |     |
|  | Fatty acid having chain length of odd number or derivative thereof C*17 |     |     |          |          |     |      |     |     |
|  | Fatty acid having chain length of odd number or derivative thereof D*18 |     |     |          |          |     |      |     |     |
|  | Lauroylmonoethanolamide   |     |     |          |          |     |      |     |     |
|  | Sodium chloride   |     |     |          |          |     |      |     |     |
|  | Water   |     |     |          | qs(100%) |     |      |     |     |
|  | Number of days accelerated  | 15  | 15  | 13       | 11       | 15  | 15   | 14  | 15  |
|  | Hair-nourishing/growing effect  | ◎   | ◎   | ○        | ○        | ◎   | ◎    | ○   | ◎   |
|  | Stickiness of hair  | ○   | ○   | ○        | ○        | ○   | ×    | ○   | ○   |
|  | Moistness of hair   | ○   | ○   | ○        | △        | ○   | ○    | ○   | △   |
|  | Smoothness of hair  | ○   | ○   | ○        | ×        | ○   | ○    | ○   | ×   |
|  | Hair-combing property   | ○   | ○   | ○        | ×        | ○   | ○    | ○   | ×   |
|  | Easiness of hairdressing  | ○   | ○   | ○        | ×        | ○   | ○    | ○   | ×   |
|  | Creakiness at the time of rinsing                                       | ○   | ○   | ○        | △        | ○   | ○    | ○   | △   |

Table 1 (continued)

|              | Example No.   |      | 20  | 21   | 22       | 23  |     |
|--------------|---|------|-----|------|----------|-----|-----|
|              | Comparative Example No.   | 6    |     |      |          |     | 7   |
| Components   | Surfactant A*1  | 15   | 15  | 15   | 5        | 30  | 15  |
|              | Surfactant B*2  |      |     |      |          |     |     |
|              | Surfactant C*3  |      |     |      |          |     |     |
|              | Surfactant D*4  |      |     |      |          |     |     |
|              | Surfactant E*5  |      |     |      |          |     |     |
|              | Surfactant F*6  |      |     |      |          |     |     |
|              | Surfactant G*7  |      |     |      |          |     |     |
|              | Surfactant H*8  |      |     |      |          |     |     |
|              | Surfactant I*9  |      |     |      |          |     |     |
|              | Polymer containing quaternary nitrogen A*10                             | 1.0  | 1.0 | 1.0  | 1.0      | 1.0 |     |
|              | Polymer containing quaternary nitrogen B*11                             |      |     |      |          |     |     |
|              | Polymer containing quaternary nitrogen C*12                             |      |     |      |          |     |     |
|              | Polymer containing quaternary nitrogen D*13                             |      |     |      |          |     |     |
|              | Polymer containing quaternary nitrogen E*14                             |      |     |      |          |     |     |
|              | Fatty acid having chain length of odd number or derivative thereof A*15 | 0.01 | 0.1 | 10.0 | 3.0      | 3.0 | 3.0 |
|              | Fatty acid having chain length of odd number or derivative thereof B*16 |      |     |      |          |     |     |
|              | Fatty acid having chain length of odd number or derivative thereof C*17 |      |     |      |          |     |     |
|              | Fatty acid having chain length of odd number or derivative thereof D*18 |      |     |      |          |     |     |
|              | Lauroyl monoethanolamide  |      |     |      |          |     | 3.0 |
|              | Sodium chloride   |      |     |      |          |     |     |
|              | Water   |      |     |      | qs(100%) |     |     |
| Performances | Number of days accelerated  | 1    | 6   | 20   | 8        | 12  | 15  |
|              | Hair-nourishing/growing effect  | ×    | ○   | ◎    | ○        | ○   | ◎   |
|              | Stickiness of hair  | ○    | ○   | ○    | ○        | ○   | ○   |
|              | Moistness of hair   | ○    | ○   | ○    | ○        | ○   | ×   |
|              | Smoothness of hair  | ○    | ○   | ○    | ○        | ○   | ×   |
|              | Hair-combing property   | ○    | ○   | ○    | ○        | ○   | ×   |
|              | Easiness of hairdressing  | ○    | ○   | ○    | ○        | ○   | ×   |
|              | Creakiness at the time of rinsing                                       | ○    | ○   | ○    | ○        | ○   | ×   |